AMENDMENTS TO THE CLAIMS

1. (Original) A method of numerical analysis of a simulation of a physical system, the physical system being describable by field equations in which a parameter is identifiable as a one-form and solving for a field equation corresponding to the parameter results in a singular differential operation, the method comprising:

directly solving the field equations modified by addition of a dummy field by numerical analysis, and

outputting at least one parameter relating to a physical property of the system.

2. (Original) An apparatus for numerical analysis of a simulation of a physical system, the physical system being describable by field equations in which a parameter is identifiable as a one-form and solving for a field equation corresponding to the parameter results in a singular differential operation, the apparatus comprising:

means for solving by numerical analysis a modification of the field equations, the modification being an addition of a dummy field, and

means for outputting at least one parameter relating to a physical property of the system.

3. (Cancelled)

4. (Cancelled)

5. (Cancelled)

6. (Original) A program storage device readable by a machine and encoding a program of instructions for executing a method of numerically analyzing a simulation of a physical system, the physical system being describable by field equations in which a parameter is identifiable as a one-form and solving for a field equation corresponding to the parameter results in a singular differential operation, the method comprising:

directly solving the field equations modified by addition of a dummy field by numerical analysis, and

outputting at least one parameter relating to a physical property of the system.

7. (Cancelled)

8. (Original) A computer program product for numerical analysis of a simulation of a physical system, the physical system being describable by field equations in which a parameter is

identifiable as a one-form and solving for a field equation corresponding to the parameter results in a singular differential operation, the computer program product comprising:

code for solving the field equations modified by addition of a dummy field by numerical analysis, and

code for outputting at least one parameter relating to a physical property of the system.

9. (Original) A computer program product for numerical analysis of a simulation of a physical system, the physical system being describable by Maxwell's field equations of which the following is a representation:

$$\nabla \times \left(\frac{1}{\mu} \nabla \times \boldsymbol{A} \right) = \boldsymbol{J} - \varepsilon \frac{\partial}{\partial t} \left(\nabla V + \frac{\partial \boldsymbol{A}}{\partial t} \right)$$

$$\nabla \cdot \boldsymbol{A} = 0$$

$$-\nabla(\varepsilon \nabla V) = \rho$$

$$\boldsymbol{E} = -\nabla V - \frac{\partial \boldsymbol{A}}{\partial t}$$

$$\boldsymbol{B} = \nabla \times \boldsymbol{A}$$

where

$$\boldsymbol{J} = \boldsymbol{J}(\boldsymbol{E}, \boldsymbol{B}, t)$$

$$\rho = \rho(\boldsymbol{E}, \boldsymbol{B}, t)$$

the computer program product comprising:

code for solving the field equations modified by addition of a dummy field by numerical analysis, and

code for outputting at least one parameter relating to a physical property of the system.

10. (Original) A method of numerical analysis of a simulation of a physical system, comprising: transmitting from a near location a description of the physical system to a remote location where a processing engine carries out a method of numerically analyzing a simulation of a physical system, the physical system being describable by field equations in which a parameter is identifiable as a one-form and solving for a field equation corresponding to the parameter results in a singular differential operation, the method comprising:

receiving at a near location at least one physical parameter related to the physical system;

directly solving the field equations modified by addition of a dummy field by numerical analysis; and

outputting at least one parameter relating to a physical property of the system.

11. (Original) An apparatus for numerical analysis of a simulation of a physical system, the physical system being describable by field equations in which a parameter is identifiable as a one-form and solving for a field equation corresponding to the parameter results in a singular differential operation, the apparatus comprising:

a solving component for solving by numerical analysis a modification of the field equations, the modification being an addition of a dummy field; and

an outputting component for outputting at least one parameter relating to a physical property of the system.

12. (Original) An apparatus for numerical analysis of a simulation of a physical system, the physical system being describable by Maxwell's field equations of which the following is a representation:

$$\nabla\times\left(\frac{1}{\mu}\nabla\times\boldsymbol{A}\right)=\boldsymbol{J}-\varepsilon\frac{\partial}{\partial t}\left(\nabla V+\frac{\partial\boldsymbol{A}}{\partial t}\right)$$

$$\nabla\cdot\boldsymbol{A}=0$$

$$-\nabla(\varepsilon\nabla V)=\rho$$

$$\boldsymbol{E}=-\nabla V-\frac{\partial\boldsymbol{A}}{\partial t}$$

$$\boldsymbol{B}=\nabla\times\boldsymbol{A}$$

where

$$\boldsymbol{J}=\boldsymbol{J}(\boldsymbol{E},\boldsymbol{B},t)$$

$$\rho=\rho(\boldsymbol{E},\boldsymbol{B},t)$$

the apparatus comprising:

a solving component for directly solving the field equations modified by addition of a dummy field by numerical analysis; and

an outputting component for outputting at least one parameter relating to a physical property of the system.

13. (Original) A apparatus according to claim 12, wherein the modified field equations are given by:

$$\nabla\times\left(\frac{1}{\mu}\nabla\times\boldsymbol{A}\right)-\gamma\,\nabla\chi \;=\boldsymbol{J}-\varepsilon\frac{\partial}{\partial t}\left(\nabla V+\frac{\partial\boldsymbol{A}}{\partial t}+\frac{\partial\nabla\chi}{\partial t}\right)$$

$$\nabla\cdot\boldsymbol{A}+\nabla^2\chi=0$$

$$-\nabla(\varepsilon\nabla V)=\rho$$

$$\boldsymbol{E}=-\nabla\left(V+\frac{\partial\chi}{\partial t}\right)-\frac{\partial\boldsymbol{A}}{\partial t}$$

$\boldsymbol{B}=\nabla\times(\boldsymbol{A}+\nabla\chi)$ where χ represents the dummy field and γ is non-zero.

14-16. (Cancelled)